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BANK STOCK RETURNS AND FINANCIAL VOLATILITY: AMGARCH-M MODELING

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By

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This study examines the sensitivity of commercial bank stock excess returns to the volatility level and financial risk factors, measured by interest rate risk and exchange rate risk across the recent Asian financial crisis horizon, via Multivariate GARCH in Mean (MGARCH-M) model. Application of time varying risk model into bank's stocks is of special importance as both the financial risk factors and the stock returns volatility varied substantially in the Asian recent financial crisis.

Generally, MGARCH (p, q)-M process captures almost all of the linear dependence in both the returns' mean, and the residual's variance of the fitted model. The results of this study further show that in Malaysia, the pattern of risk sensitivity is about the same for both large and small banks during the crisis period. Unlike studies from developed

markets, the portfolio partition in the case of Malaysia did not provide significant difference on bank stocks risk exposures.

Before the crisis, the excess returns generally followed white noise process and the residual variances have strong GARCH effects, indicating that the current volatility of bank's stocks persisted from past periods. The banks equity returns and its volatility fails to show a pricing relationship with its volatility level and financial risk factors, due to close regulatory framework set by government on the economy system.

During the crisis period, commercial banks' hedging activities, and government interventions in both the financial factors, had stabilized the bank stocks' volatility. This can be explained because during crisis, bank stocks' returns followed a white noise process while the GARCH effects in the variances equation are very weak. Furthermore, when the market is in disorder, bank's stocks performance could be better explained by the overall market's performance and the annoyances in the market.

After the financial control, due to the unexpected interest rate policy and the merger announcement, large bank's returns are increasingly sensitive to its own volatility. The stock's prices of small banks are only exposed to interest rate volatility but its magnitude is relatively larger than large banks'. The forced consolidation program has strongly affected the confidence of investors on the performance of small banks as the small bank's volatility is significantly driven by the interest rate volatility.

It seems that the recent crisis had affected the exposure of bank's stocks to risk. Investors seem to be more actively engaged as reflected by the significant risks concern in bank's stocks pricing. The control and announced consolidation program fail to regain investors' full confidence in bank's stocks. Nevertheless, in view of long run welfare, the increasing risk concern in bank's stocks will contribute to the development of the domestic banks. When the market prices the stocks, the prices will reflect the true value and the performance of the banks. This will further enhance the market efficiency on banking stocks and contribute to future expansion, by ensuring an effective intermediation of fund to the efficient banks.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PULANGAN SAHAM BANK DAN KEMUDAHURAPAN KEWANGAN: MODEL MGARCH-M

OLEH

HOOY CHEE WOOI

Februari 2002

Pengerusi : Profesor Madya Dr Tan Hui Boon

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Kajian ini menguji kepekaan pulangan lebihan saham bank komersil terhadap tahap kemudahurapan dan faktor risiko kewangan yang diukur oleh risiko kadar bunga dan risiko kadar petukaran matawang asing menerusi tempoh krisis kewangan Asian yang berlaku kebelakangan ini, dengan menggunakan Model Multivariat Teritlak Autoregresi dan Heteroskedastisiti Bersyarat Dalam Min (MGARCH-M). Aplikasi model risiko yang berlandaskan masa adalah sangat penting untuk saham bank kerana dalam krisis kewangan kebelakangan ini, kedua-dua faktor kewangan dan ketidaktentuan pulangan saham telah berubah dengan besar.

Secara amnya, MGARCH-M merangkupi hampir semua pergantungan linear dalam min pulangan dan varian bagi baki model yang terpilih. Keputusan kajian ini menunjukan bahawa di Malaysia, bentuk kepekaan risiko bagi bank besar dan kecil

semasa tempoh krisis adalah agak sama. Berbeza dengan kajian dari pasaran negara maju, pembahagian portfolio di Malaysia tidak memberi perbezaan nyata dalam pendedahan risiko saham bank.

Sebelum krisis, pulangan saham bank umumnya mempunyai proses riuh putih dan varians bakinya mempunyai kesan GARCH yang kuat, menunjukkan kemudahurapan semasa adalah berterusan dari masa lampau. Pulagan ekuiti bank dan kemudahurapannya gagal menunjukan hubugan harga dengan kemudahurapan sendiri dan factor risiko kewangan, disebabkan oleh penetapan peraturan yang ketat digubah oleh kerajaan atas system ekonomi.

Semasa krisis berlaku, kegiatan lindung harga oleh bank komercial dan campurtangan kerajaan dalam kedua-dua factor kewangan, telah menstabilkan kemudahurapan saham bank. Ini boleh diterangkan kerana semasa krisis kewangan berlaku, saham bank mempunyai proses riuh putih sementara kesan GARCH di persamaan varians adalah sangat lemah. Tambahan pula, apabila pasaran tidak teratur, prestasi saham bank lebih sesuai diterangkan oleh prestasi keseluruhan pasaran serta gangguan pasaran.

Selepas kawalan modal, disebabkan oleh polisi kadar bunga yang tidak terjangka dan pengumuman pergabungan bank, pulangan saham bank besar telah bertambah sensitive kepada kemudahurapan sendirinya. Harga saham bank kecil hanya terdedah kepada kemudahurapan kadar bunga, tetapi kesan kemudahurapan kadar bunga ke atas bank kecil adalah relatif lebih besar daripada kesannya ke atas bank besar. Program

pergabungan paksa telah kuat menpengaruhi keyakinan pelabur atas pencapaian bank kecil kerana kemudahurapan bank kecil sekarang telah didorong oleh kemudahurapan kadar bungan.

Nampaknya krisis kebelakangan ini telah menpengaruhi pendedahan saham bank ke atas risiko. Pelabur nampaknya menjadi lebih aktif dalam urusniaga sebagaimana yang dicerminkan oleh peningkatan perhatian terhadap risiko, dalam proses peletakan harga saham bank. Program pengawalan dan pergabungan yang diumumkan oleh kerajaan gagal memulihkan keyakinan para pelabur dengan sepenuhnya terhadap saham bank domestik. Walau bagaimanapun, untuk kebajikan janka panjang, peningkatan perhatian terhadap risiko akan menyumbang kepada pembangunan bank-bank domestic. Apabila harga saham ditentukan oleh pasaran, harga terbabit akan mencerminkan nilai sebenar and prestasi bank-bank. Ini akan meningkatkan kecekapan pasaran bagi saham-saham bank dan menyumbang kepada perkembangan bank pada masa depan, dengan memastikan satu penyaluran wang yang berkesan kepada bank-bank cekap.

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I certify that an Examination Committee met on 6th February 2002 to conduct the final examination of Hooy Chee Wooi on his Master of Science thesis entitled "Bank Stock Returns and Financial Volatility: A MGARCH-M Model" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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Date: 9 MAY 2002

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

HOOY CHEE WOOI
Date: 13/3/2002

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AIC	Akaike Information Criterion
APT	Arbitrage Pricing Theory
ARCH	Autoregressive Conditional Heteroscedasticity
ARCH-M	ARCH in mean
ARMA	Autoregressive Moving Average
CAPM	Capital Asset Pricing Model
GARCH	Generalized ARCH
GARCH-M	GARCH in mean
MGARCH-M	Multivariate GARCH-M
KLIBOR	Kuala Lumpur Interbank Offered Rates
SC	Schwarz Criterion

CHAPTER 1

INTRODUCTION

During the recent Asian financial crisis, banks' failure rules the day. In the case of Malaysia, where the banking institutions are under close regulation by the government, the scenario is quite different. Malaysian government is particularly concerns about the development of the banking industry and its performance. As such, during the crisis, the government had conducted various rescue program to ensure that the industry preserved its stability and stand in its competitive position. This has more or less affected the performance of the commercial bank's stocks.

The movement of the commercial bank's stocks is seen as an important indicator of performance of the commercial banks. This however, depend much on the sensitivity of the bank's stocks to various risk factors, especially exchange rate and interest rate. If the bank's stocks are very sensitive to those risk factors, then the performance of the bank will lead by the movement of these factors. Otherwise, the bank will be able to remain competitive under various circumstances. The sensitivity nevertheless, depends much on how bank practices its risk management, beside some external factors, such as the investor's behavior and confidence.

This study covers the relationship of the returns of domestic commercial bank's stocks with the risk of financial factors across the time horizon of the recent financial crisis. As an emerging country, the banking industry in Malaysia is still immature

compared to that of developed nations. The rational of this study is to provide an extensive understanding of the natures of various risk return trade-off of Malaysian commercial bank's stocks. By analyzing the effect of the unanticipated changes of the exchange rate and interest rate on the bank's stocks during crisis, it may provide an alternative to policy maker in their decision-making regarding the effectiveness of their policies.

The first section of this chapter addresses the Asian financial crisis, starting from its background to the volatilities of the financial factors and bank's stocks. The second part of this chapter covers the problem statement of the research. The objectives of the study are stated in the third section. Finally, the last section emphasizes the significance of the research.

1.1 Commercial Banks and the Crisis

1.1.1 Asian Financial Crisis

During the 1990s, there were three financial crises in the global economy; the ERM crisis in 1993, the Latin Mexico financial crisis in 1995, and the recent Asian financial crisis in 1997. The recent Asian financial crisis has its own unique features due to the severity of the contagion effect. Thailand was the first victims of the Asian financial crisis and the explosion of the contagion effect was too fast to be expected.

From a localized currency crisis in Thailand, it augmented into a regional financial crisis in East Asia, and further spread to Russia and Latin America, within just a year time.

The financial crisis became official on July 2, 1997 when the IMF team arrived in Bangkok to help resolving the economics crisis. After the depreciation of the Thai bath, the Philippine peso and the Indonesian rupiah were also forced to float more freely. The selling pressure was spreading tremendously and hit the currency of Malaysia ringgit (RM) and Singapore dollar. The pressures on the currencies then spread outside South-East Asia to the Korean won, the Hong Kong dollar and the Taiwan dollar. From one of the best performing regions in the world, the economies of Indonesia, Thailand and Korea were contracted by -13.7%, -9.4% and -5.8% respectively in 1998. The crisis also features the largest financial rescue in history from International Monetary Fund (IMF)[1] (BNM, 1999).

In Malaysia, the turmoil affected the economics and business dynamism in the nation through various prospects. The KLSE composite index crashed badly and RM had devaluated to its historical low level relative to USD. The fall of the RM consequently causes the deterioration of the composite index and market capitalization in KLSE. As depicted in figure 1, the composite index drops more than 700 points within a few months after the crisis occurred, so as the market capitalization. The index

[1] For example, in end-1997, just a few month after the crisis occur, the IMF had injected SDR 2.9 billion (about US$ 3.9 billion) for Thailand, SDR 7.338 billion (about US$ 10.14 billion) for Indonesia, SDR 15.5 billion (about US$ 21 billion) for Korea.

started to recover just after September 1998, when the government imposed the capital control package.

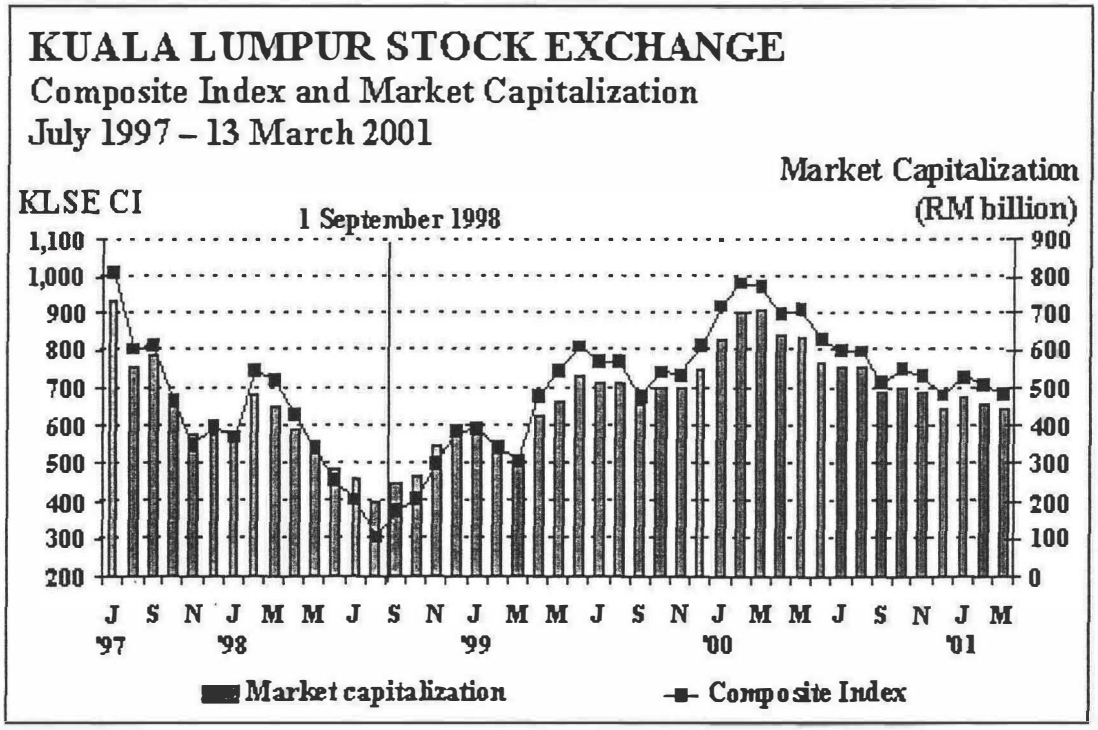

Figure 1: Composite index and market capitalization of KLSE

About a year after the crisis, the government had taken a drastic step by implementing the selected capital control and pegged its exchange rate at 3.8 RM per 1 USD in order to prevent its currency from further deterioration. In order to stabilize the economy, Danahharta was established to solve the problem of bad loans in financial institutions, followed by Danahmodal to inject funds to re-capitalize and rescue the problematic financial institutions. The consolidation program of the domestic financial sectors was later been announced to reposition the domestic banks and finance companies.

1.1.2 Volatility of Financial Factors

The crisis, spread to almost all the regional economy and created many bankruptcy and bank failures in the countries involved. Malaysia was of no exception from the regional crisis. During the crisis, besides the stock market, two of the country's most important financial indicators, the exchange rate and interest rate, suffered the most changes and became very volatile.

The Malaysian currency depreciated to its historically low relative to USD within a few months. Figure 2 depicts the changes of RM/USD exchange rate from January 1995 to July 2000, with a sharp deterioration of the RM during the crisis. The RM was fixed on September 1998 after the implementation of the capital control.

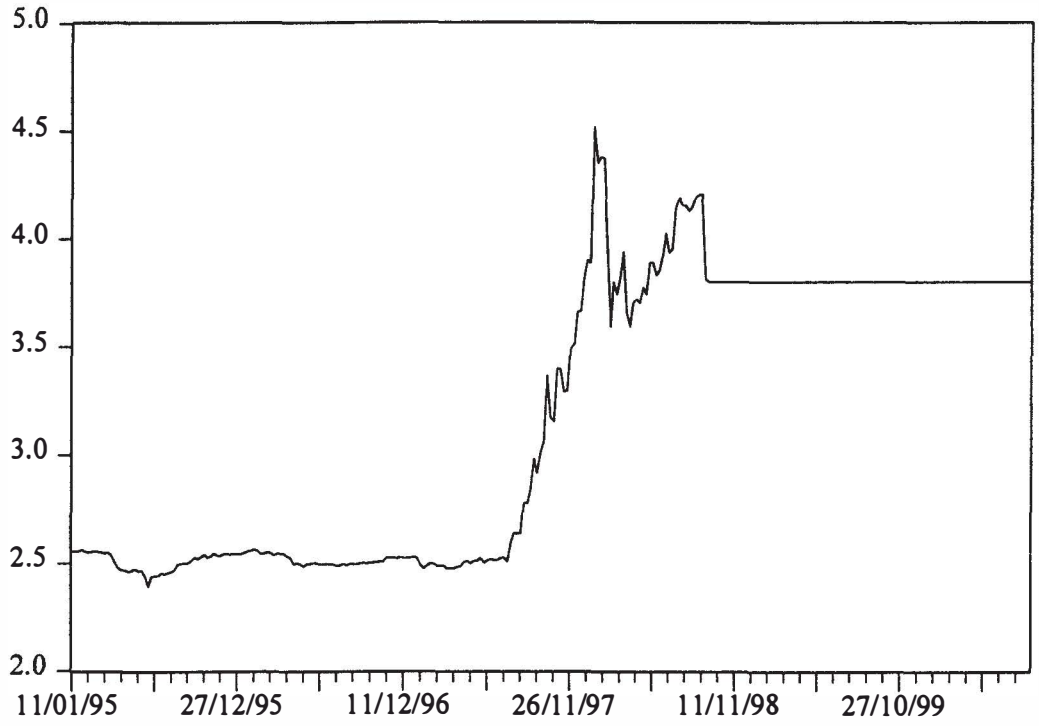

Figure 2: Exchange rate level from January 1995 to July 2000 (RM / USD)

In order to counter the crisis, the Malaysian government adjusted the market's interest rate on several occasions. As depicted in Figure 3, the trend of the interest rate level in Malaysia is quite stable before July 1997. After the crisis occurred, interest rate level rose to a significant high level (over 10%) and dropped back to fewer than 7% just within a few weeks time. There were changes several times along 1998, but the interest rate level began to fall step by step after capital control was instituted at the end of 1998. Currently, the interest rate level is about 3%.

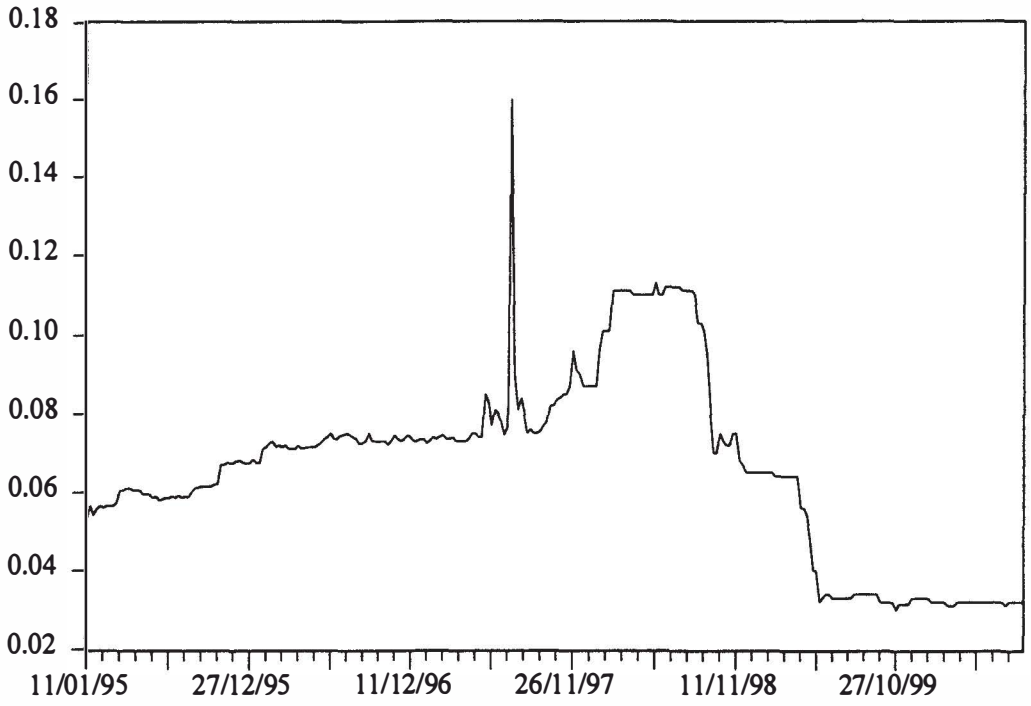

Figure 3: Interest rate level from January 1995 to July 2000 (3-month KLIBOR rate)

From figure 2 and figure 3, note that the changes of both financial factors during the crisis was abnormally larges. Using the ARMA-GARCH model, the volatility of the exchange rate and interest rate are generated and depicted in figure 4 and figure 5 respectively.